SEQUENCE LISTING

<110> Smeekens, J.C.M.
       Ebskamp, Michael
       Geerts, Hendrikis
       Weisbeek, Petrus

<120> Production of Oligosaccharides in Transgenic Plants

<130> ARNO-1-15313

<140> US 09/543,861
<141> 2000-03-24

<150> US 09/019,385
<151> 1998-02-05

<150> US 09/193,385
<151> 1998-11-17

<150> US 08/479,470
<151> 1995-06-07

<150> NL 1000064
<151> 1995-04-05

<150> NL 9401140
<151> 1994-08-07

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ggc aag cca ccg cta ccg tac gcc tac aag ccg ctg ccc tcg gac gcc   105
Gly Lys Pro Pro Leu Pro Tyr Ala Tyr Lys Pro Leu Pro Ser Asp Ala
5   10   15   20

gcc gac ggt aag cgg acc ggc tgc atg agg tgg tcc gcg tgt gcc acc   153
Ala Asp Gly Lys Arg Thr Gly Cys Met Arg Trp Ser Ala Cys Ala Thr
                25   30   35

gtg ctg acg gcc tcg gcc atg gcg gtg gtg gtg gtc ggc gcc acg ctc   201

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Val Leu Thr Ala Ser Ala Met Ala Val Val Val Val Gly Ala Thr Leu
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ctg gcg gga ttg agg atg gag cag gcc gtc gac gag gag gcg gcg gcg    249
Leu Ala Gly Leu Arg Met Glu Gln Ala Val Asp Glu Glu Ala Ala Ala
        55              60                      65

ggc ggg ttc ccg tgg agc aac gag atg ctg cag tgg cag cgc agc ggt    297
Gly Gly Phe Pro Trp Ser Asn Glu Met Leu Gln Trp Gln Arg Ser Gly
        70              75                      80

tac cat ttc cag acg gcc aag aac tac atg agc gat ccc aac ggc ctg    345
Tyr His Phe Gln Thr Ala Lys Asn Tyr Met Ser Asp Pro Asn Gly Leu
85              90              95                      100

atg tat tac cgt gga tgg tac cac atg ttc tac cag tac aac ccg gtg    393
Met Tyr Tyr Arg Gly Trp Tyr His Met Phe Tyr Gln Tyr Asn Pro Val
            105             110                 115

ggc acc gac tgg gac gac ggc atg gag tgg ggc cac gcc gtg tcc cgg    441
Gly Thr Asp Trp Asp Asp Gly Met Glu Trp Gly His Ala Val Ser Arg
            120             125                 130

aac ctt gtc caa tgg cgc acc ctc cct atc gcc atg gtg gcc gac cag    489
Asn Leu Val Gln Trp Arg Thr Leu Pro Ile Ala Met Val Ala Asp Gln
            135             140                 145

tgg tac gac atc ctc gga gtc ctc tcg ggc tcc atg acg gtg cta ccc    537
Trp Tyr Asp Ile Leu Gly Val Leu Ser Gly Ser Met Thr Val Leu Pro
            150                 155             160

aac ggg acg gtc atc atg atc tac acg ggc gcc acc aac gcc tcc gcc    585
Asn Gly Thr Val Ile Met Ile Tyr Thr Gly Ala Thr Asn Ala Ser Ala
165                 170                 175             180

gtg gag gtc cag tgc atc gcc acc ccg gcc gac ccc aac gac ccc ctc    633
Val Glu Val Gln Cys Ile Ala Thr Pro Ala Asp Pro Asn Asp Pro Leu
                185                 190                 195

ctc cgc cgg tgg acc aag cac ccc gcc aac ccc gtc atc tgg tcg ccg    681
Leu Arg Arg Trp Thr Lys His Pro Ala Asn Pro Val Ile Trp Ser Pro
            200                 205                 210

ccg ggg gtc ggc acc aag gat ttc cga gac ccg atg acc gcc tgg tac    729
Pro Gly Val Gly Thr Lys Asp Phe Arg Asp Pro Met Thr Ala Trp Tyr
            215                 220                 225

gac gag tcc gac gag aca tgg cgc acc ctc ctc ggg tcc aag gac gac    777
Asp Glu Ser Asp Glu Thr Trp Arg Thr Leu Leu Gly Ser Lys Asp Asp
        230                 235                 240

cac gac ggc cac cac gac ggc atc gcc atg atg tac aag acc aag gac    825
His Asp Gly His His Asp Gly Ile Ala Met Met Tyr Lys Thr Lys Asp
245                 250                 255                 260

ttc ctc aac tac gag ctc atc ccg ggc atc ttg cac cgg gtg gtg cgc    873
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2

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Phe Leu Asn Tyr Glu Leu Ile Pro Gly Ile Leu His Arg Val Val Arg
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acc ggc gag tgg gag tgc atc gac ttc tac ccc gtc ggc cgg aga agc    921
Thr Gly Glu Trp Glu Cys Ile Asp Phe Tyr Pro Val Gly Arg Arg Ser
                280              285              290

agc gac aac tcg tcg gag atg ctg cac gtg ttg aag gcg agc atg gac    969
Ser Asp Asn Ser Ser Glu Met Leu His Val Leu Lys Ala Ser Met Asp
                295              300              305

gac gaa cgg cac gac tac tac tcg ctg ggc acg tac gac tcg gcg gcc   1017
Asp Glu Arg His Asp Tyr Tyr Ser Leu Gly Thr Tyr Asp Ser Ala Ala
310              315              320

aac acg tgg acg ccc atc gac ccg gag ctc gac ttg ggg atc ggg ctg   1065
Asn Thr Trp Thr Pro Ile Asp Pro Glu Leu Asp Leu Gly Ile Gly Leu
325              330              335              340

aga tac gac tgg gga aag ttt tat gcg tcc acc tcc ttc tat gat ccg   1113
Arg Tyr Asp Trp Gly Lys Phe Tyr Ala Ser Thr Ser Phe Tyr Asp Pro
                345              350              355

gcc aag aac cgg cgc gtg ctc atg ggg tac gtc ggc gag gtc gac tcc   1161
Ala Lys Asn Arg Arg Val Leu Met Gly Tyr Val Gly Glu Val Asp Ser
                360              365              370

aag cgg gct gat gtc gtc aag gga tgg gct tcc att cag tca gtt cct   1209
Lys Arg Ala Asp Val Val Lys Gly Trp Ala Ser Ile Gln Ser Val Pro
                375              380              385

agg acg gtg gct ctg gat gag aag acc cgg acg aac ctc ctg ctc tgg   1257
Arg Thr Val Ala Leu Asp Glu Lys Thr Arg Thr Asn Leu Leu Leu Trp
390              395              400

ccc gtt gag gag atc gag acc ctc cgc ctc aat gcc acg gaa ctg acc   1305
Pro Val Glu Glu Ile Glu Thr Leu Arg Leu Asn Ala Thr Glu Leu Thr
405              410              415              420

gac gtt acc att aac act ggc tcc gtc atc cat atc ccg ctc cgc caa   1353
Asp Val Thr Ile Asn Thr Gly Ser Val Ile His Ile Pro Leu Arg Gln
                425              430              435

ggc act cac gct cga cat gcg gag gcc tct ttc cac ctt gat gct tcc   1401
Gly Thr His Ala Arg His Ala Glu Ala Ser Phe His Leu Asp Ala Ser
                440              445              450

gcc gtg gct gcc ctc aac gag gcc gat gtg ggc tac aac tgc agt agc   1449
Ala Val Ala Ala Leu Asn Glu Ala Asp Val Gly Tyr Asn Cys Ser Ser
                455              460              465

agc ggc ggc gct gtt aac cgc ggc gcg cta ggc ccc ttc ggc ctc ctc   1497
Ser Gly Gly Ala Val Asn Arg Gly Ala Leu Gly Pro Phe Gly Leu Leu
470              475              480

gtc ctc gcc gcc ggt gac cgc cgt ggc gag caa acg gcg gtc tac ttc   1545
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3

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Val Leu Ala Ala Gly Asp Arg Arg Gly Glu Gln Thr Ala Val Tyr Phe
485                 490                 495                 500

tac gtg tct agg ggc ctt gac gga ggc ctc cac acc agc ttc tgc caa    1593
Tyr Val Ser Arg Gly Leu Asp Gly Gly Leu His Thr Ser Phe Cys Gln
                505                 510                 515

gat gag ctg aga tcg tca cga gcc aag gat gtg acc aag cgt gtc atc    1641
Asp Glu Leu Arg Ser Ser Arg Ala Lys Asp Val Thr Lys Arg Val Ile
                520                 525                 530

ggg agc acg gtg ccg gtg ctc gac ggt gag gct ttg tca atg agg gtg    1689
Gly Ser Thr Val Pro Val Leu Asp Gly Glu Ala Leu Ser Met Arg Val
                535                 540                 545

ctc gtg gat cac tcc atc gtg cag ggc ttc gac atg ggc ggg agg acc    1737
Leu Val Asp His Ser Ile Val Gln Gly Phe Asp Met Gly Gly Arg Thr
    550                 555                 560

acg atg acc tcg cgg gtg tac ccg atg gag tcg tat cag gag gca aga    1785
Thr Met Thr Ser Arg Val Tyr Pro Met Glu Ser Tyr Gln Glu Ala Arg
565                 570                 575                 580

gtc tac ttg ttc aac aac gcc acc ggt gcc agc gtg acg gcg gaa agg    1833
Val Tyr Leu Phe Asn Asn Ala Thr Gly Ala Ser Val Thr Ala Glu Arg
                585                 590                 595

ctg gtc gtg cac gag atg gac tcg gca cac aac cag ctc tcc aat gag    1881
Leu Val Val His Glu Met Asp Ser Ala His Asn Gln Leu Ser Asn Glu
                600                 605                 610

gac gat ggc atg tat ctt cat caa gtt ctt gaa tct cgt cat            1923
Asp Asp Gly Met Tyr Leu His Gln Val Leu Glu Ser Arg His
                615                 620                 625

taataagcta cattggatca aagaagatca ccagggaagg gcaattcata cataaatcga    1983

atcattctgc acaacctcgc ttgcagcatg cattgaaaca tctgtatttg gatcatcttc    2043

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4

Ala Cys Ala Thr Val Leu Thr Ala Ser Ala Met Ala Val Val Val
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Gly Ala Thr Leu Leu Ala Gly Leu Arg Met Glu Gln Ala Val Asp Glu
     50   55   60

Glu Ala Ala Ala Gly Gly Phe Pro Trp Ser Asn Glu Met Leu Gln Trp
65   70   75   80

Gln Arg Ser Gly Tyr His Phe Gln Thr Ala Lys Asn Tyr Met Ser Asp
          85   90   95

Pro Asn Gly Leu Met Tyr Tyr Arg Gly Trp Tyr His Met Phe Tyr Gln
        100   105   110

Tyr Asn Pro Val Gly Thr Asp Trp Asp Asp Gly Met Glu Trp Gly His
        115   120   125

Ala Val Ser Arg Asn Leu Val Gln Trp Arg Thr Leu Pro Ile Ala Met
     130   135   140

Val Ala Asp Gln Trp Tyr Asp Ile Leu Gly Val Leu Ser Gly Ser Met
145   150   155   160

Thr Val Leu Pro Asn Gly Thr Val Ile Met Ile Tyr Thr Gly Ala Thr
        165   170   175

Asn Ala Ser Ala Val Glu Val Gln Cys Ile Ala Thr Pro Ala Asp Pro
        180   185   190

Asn Asp Pro Leu Leu Arg Arg Trp Thr Lys His Pro Ala Asn Pro Val
        195   200   205

Ile Trp Ser Pro Pro Gly Val Gly Thr Lys Asp Phe Arg Asp Pro Met
210   215   220

Thr Ala Trp Tyr Asp Glu Ser Asp Glu Thr Trp Arg Thr Leu Leu Gly
225   230   235   240

Ser Lys Asp Asp His Asp Gly His His Asp Gly Ile Ala Met Met Tyr
        245   250   255

Lys Thr Lys Asp Phe Leu Asn Tyr Glu Leu Ile Pro Gly Ile Leu His
        260   265   270

Arg Val Val Arg Thr Gly Glu Trp Glu Cys Ile Asp Phe Tyr Pro Val
        275   280   285

Gly Arg Arg Ser Ser Asp Asn Ser Ser Glu Met Leu His Val Leu Lys
290   295   300

Ala Ser Met Asp Asp Glu Arg His Asp Tyr Tyr Ser Leu Gly Thr Tyr
305   310   315   320

Asp Ser Ala Ala Asn Thr Trp Thr Pro Ile Asp Pro Glu Leu Asp Leu
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Gly Ile Gly Leu Arg Tyr Asp Trp Gly Lys Phe Tyr Ala Ser Thr Ser
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Phe Tyr Asp Pro Ala Lys Asn Arg Arg Val Leu Met Gly Tyr Val Gly
        355   360   365

Glu Val Asp Ser Lys Arg Ala Asp Val Val Lys Gly Trp Ala Ser Ile
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Gln Ser Val Pro Arg Thr Val Ala Leu Asp Glu Lys Thr Arg Thr Asn
385   390   395   400

Leu Leu Leu Trp Pro Val Glu Glu Ile Glu Thr Leu Arg Leu Asn Ala
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Thr Glu Leu Thr Asp Val Thr Ile Asn Thr Gly Ser Val Ile His Ile
                420   425   430

Pro Leu Arg Gln Gly Thr His Ala Arg His Ala Glu Ala Ser Phe His
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Leu Asp Ala Ser Ala Val Ala Ala Leu Asn Glu Ala Asp Val Gly Tyr
        450   455   460

Asn Cys Ser Ser Ser Gly Gly Ala Val Asn Arg Gly Ala Leu Gly Pro
465   470   475   480

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Phe Gly Leu Leu Val Leu Ala Ala Gly Asp Arg Arg Gly Glu Gln Thr
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Ala Val Tyr Phe Tyr Val Ser Arg Gly Leu Asp Gly Gly Leu His Thr
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Ser Phe Cys Gln Asp Glu Leu Arg Ser Ser Arg Ala Lys Asp Val Thr
            515                 520                 525

Lys Arg Val Ile Gly Ser Thr Val Pro Val Leu Asp Gly Glu Ala Leu
    530                 535                 540

Ser Met Arg Val Leu Val Asp His Ser Ile Val Gln Gly Phe Asp Met
545                 550                 555                 560

Gly Gly Arg Thr Thr Met Thr Ser Arg Val Tyr Pro Met Glu Ser Tyr
            565                 570                 575

Gln Glu Ala Arg Val Tyr Leu Phe Asn Asn Ala Thr Gly Ala Ser Val
            580                 585                 590

Thr Ala Glu Arg Leu Val Val His Glu Met Asp Ser Ala His Asn Gln
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Leu Ser Asn Glu Asp Asp Gly Met Tyr Leu His Gln Val Leu Glu Ser
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Arg His
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Tyr Tyr Arg Gly Trp Tyr His Met Phe Tyr Gln Tyr Asn Pro Val Gly
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Thr Asp Trp Asp Asp Gly Met Glu Trp Gly His Ala Val Ser Arg
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Ser Gly Ser Met Thr Val Leu Pro
1   5

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Phe Arg Asp Pro Met Thr Ala Trp Tyr Asp

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<213>  Peptide

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1                   5                       10


<210>  11
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<213>  Peptide


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<223>  Xaa is the nucleotide equivalent of any set containing "n"


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1                   5                       10


<210>  12
<211>  15
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<213>  Peptide


<220>
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<222>  (1)..(15)
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Ala Val Pro Val Xaa Leu Xaa Xaa Pro Leu Xaa Ile Xaa Trp Val
1                   5                       10                  15
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